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ABSTRACT

The present study was an exploratory investigation of factors that differentiate students who exhibit "negative educational growth" from a group of equally able students who exhibit marked "positive educational growth." Educational growth was operationally defined as estimated true test-retest change on American College Tests (ACT) composite score, and will be referred to as "estimated true growth." Of the 646 students in the sample, 193 exhibited negative estimated true educational growth, and an equal number exhibited positive estimated growth. Results showed that the negative growth group was differentiated from the positive growth group by habits, attitudes, self-concept, hostility, conformity, religious background and orientation, family relations, social relations, goals, high school achievement and certain personality characteristics. There were noteworthy differences between the two sexes on differentiating factors. (SJ)

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AN EXPLORATORY STUDY OF FACTORS DIFFERENTIATING FRESHMEN EDUCATIONAL GROWTH [1]

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Officials at most colleges and universities would agree that a primary goal of their institution is to help students grow educationally. They would also agree that more success in reaching this goal is obtained with some students than with others. Research results through the years would support such a conclusion. Students with equal initial ability vary on the amount of improvement they show on educational development tests given after a period of college attendance. In fact, results generally include a sizable number of students who decrease on retest, and this cannot be completely accounted for by phenomena such as regression and ceiling effects.

In one of the first studies that involved retesting on the American Council on Education Psychological Examination, McConnell (1934) stated, "It would be interesting to know what factors were responsible for such large gains on the one hand, and for losses or

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[1] Paper prepared for presentation at the 1969 annual meeting of the American College Student Personnel Association, March 16, 1970, St. Louis, Missouri. The author is deeply indebted to Luther A. Marsh and Abilene Christian College for sharing their raw data with him so that he could conduct this study. For a more comprehensive report of this as well as a related study investigating factors linearly related to educational growth, see Lenning (1969).

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relatively small gains on the other (p. 68)." Many test-retest studies of college students have taken place since that time (Barnes, 1943; Bayley, 1957; Bradway, 1961; Coffman and Parry, 1967; Coladarci, 1960; Cowdery, 1928; Deigman, 1959; Flory, 1940; Freeman and Flory, 1937; Hartson, 1936; Hunter, 1942; Lenning, Munday, and Maxey, 1968; Livesay, 1939; Louise, 1947; Miles, 1933; Miles and Miles, 1932; McConnel, 1934; Munday and Hoyt, 1964; Rogers 1930; Silvey, 1951; Shuey, 1948; Stalnaker and Stalnaker, 1946). These studies have concentrated on the relationship of intervening experiences (such as college courses and activities) to the amount of "educational growth" that occurs in college students, however.

For one reason or another, researchers seem to have forgotten or ignored the challenge put forth by McConnel back in 1934. Characteristics and background factors that the student brings into the college situation with him have been largely ignored in studies of test-retest change. Yet, such factors may, to a large extent, determine what college experiences would be most effective in bringing about the desired change for individual students.

The present study was an exploratory investigation of factors that differentiate students who exhibit "negative educational growth" from a group of equally able students who exhibit marked "positive educational growth." It was hoped that the present investigation would stimulate research on this topic and would suggest variables for future research.

Criterion

Since the American College Tests (ACT) measure basic skills necessary for success in college (American College Testing Program, 1965)[2], and since most educators would like to see students improve in these skills, educational growth was operationally defined for the study as estimated true test-retest change on ACT Composite score. Each student's observed test-retest score after one year of college was corrected for unreliability through a procedure initially formulated by Lord (1956). This is the best possible estimate of true score change for a student and shall hereafter be referred to as "estimated true educational growth," or merely as "estimated true growth."

An earlier pilot study involving students at five colleges (Lenning, Munday, and Maxey, 1968) had indicated that in general there are statistically significant mean gains on ACT retest after one or two years of college. However, there was a wide variation among students on amount of test-retest growth and a number of students actually went down on retest as is indicated in Table 1. Some of this was undoubtedly caused by regression and ceiling effects, but it was clear that other factors were of major importance.

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[2] The American College Tests emphasize such skills as the ability to handle algebraic manipulations, to analyze and solve problems, to make inferences, to think critically, to use language effectively, to read with comprehension, to recognize writers' styles and biases, and to apply reading to new situations. How the student can apply his knowledge is emphasized, rather than the knowledge of detailed subject matter.

Insert Table 1 about here

Although the Lenning, et. al., study was primarily concerned with the relationship of ACT score change in different subject areas (there are four ACT subtests: English, Mathematics, Social Studies, and Natural Science) to amount of course work taken in the appropriate area, two findings are applicable to the present study. One of these findings was that there were significant differences between males and females on some of the change measures. Secondly, there were significant institutional differences that could not be accounted for by regression and ceiling effects. For example, the college with the highest initial score means for all subtests exhibited more gain on the ACT Social Studies and Natural Sciences tests than did any of the other colleges. If it were not for ceiling and regression effects, this difference in gain would have been even more marked. In contrast, less gain on the English test was present for this college than for any other.

Predictors

A large variety of data were available for students in the study. Included were standardized measures of opinions, attitudes, aptitudes, achievement, study habits, critical thinking, and personality. Several social, demographic, and personal self-report questionnaires had also been completed by the students. A description of all of the assessment

devices used is included in the testing project manual (Marsh, 1969). A copy of the Marsh manual is included in the original comprehensive report of this study (Lenning, 1969). Instruments used included the following:

CSOS - College Student Opinion Survey (pretest and posttest)
CSQ - ETS IRPHE College Student Questionnaires (pretest and posttest forms)
CUES - College and University Environment Scales (pretest and posttest)
CTMM - California Test of Mental Maturity (pretest)
ECT - CEEB English Composition Test (pretest)
- Nelson-Denny Reading Test (pretest)
SSHA - Brown-Holtzman Survey of Study Habits and Attitudes (pretest)
- Watson-Glaser Critical Thinking Appraisal (pretest)
CPI - California Personality Inventory (posttest)
16PF - Sixteen Personality Factor Questionnaire (pretest)
- Rokeach Authoritarianism Scale (posttest)
- Rokeach Dogmatism Scale (posttest)
MMPI - Eight scales of the Minnesota Multiphasic Personality Inventory (posttest)
- Marsh Social and Demographic Questionnaire (pretest and posttest forms)
- ACT Student Profile Section college goals scales (pretest and posttest)
- Special questionnaire utilizing several scales being developed for the ACT Institutional Self-Study Survey instrument (posttest)

Sample

Since the present study was completely exploratory and was to examine a large number of independent variables, and since the previous study (Lenning, et. al., 1969) had indicated definite institutional differences, it was considered desirable to study students at only one institution.

Later studies could explore other campus settings and groups of similar colleges. Therefore, the study was limited to one rather homogenous student body.

The sample for the study consisted of the 1967-68 freshmen at a conservative church-related liberal arts college in the southwestern United States. Primary reasons for choosing this particular college were the availability of a variety of data, an adequate sample size, and the willingness of institutional officials to cooperate. Also, findings of the previous study (Lenning, et. al., 1969) had suggested that a larger percentage of "negative growth" students might be found at a church-related college similar to the one selected (see Table 1). In addition, it was felt that a liberal arts college would have more similarity among freshmen on curricular course work taken.

Most of the 799 students in the sample took the ACT examination initially during their senior year in high school. In May of their college freshman year, 646 of the students were retested with an equivalent form of the ACT. Of the students who did not take the retest, many had dropped from school in the interim and other students did not take the retest for various reasons.

It should be pointed out that all ACT pretest scores were adjusted to a point that is considered (based on past experience) to be equivalent to November of the senior year in high school. This is a

routine procedure of the ACT Program so that students taking the test battery at a later date will not have an advantage over students taking it earlier. The retest scores were adjusted downward exactly the same amount as the adjustment made for pretest scores obtained during college freshman registration week, so the observed change from pretest to posttest could conceivably be considered to be the change that took place during the period of college attendance.

Of the 646 students who took both the pretest and the posttest, 193 exhibited negative estimated true educational growth. These 193 students comprised what was called the "negative growth group." An equal number of equally-able students who exhibited marked estimated true growth in the positive direction comprised what was called the "positive growth group." The positive growth group had been matched on pretest ACT scores to the negative growth group by using stratified random methods.

Method

Multiple stepwise discriminant analyses were utilized for frequency data to discover student factors that differentiated the negative growth from the positive growth group. Since so many predictor variables were being considered, a large number of separate discriminant analysis computer runs were made to keep the statistical power

within an acceptable range. Heeding an empirical finding of Halinski (1968) for regression analysis, the ratio of sample size to the number of predictors being examined was kept above 20:1.

Since the discriminant analysis computer program available had no missing-data provisions, and in order to have the N-count as large as possible for each computer run, which variables were included together in a run was determined by which instruments were given to the same students to the largest extent.

After all of the predictors had been included in a discriminant analysis computer run, all variables found to significantly differentiate the two groups were analyzed together in a final computer run. N-counts were lower for the final computer runs than for the preliminary runs because only those students with data available for all predictors under study could be included in the final discriminant analyses.

For frequency data, chi square tests for independence were conducted. Yates' correction was used in computing a chi square value whenever there was only one degree of freedom. For cases involving more degrees of freedom, rules presented by Walker and Lev (1953, p. 107) were followed in testing for significance.

The earlier pilot study had indicated sex differences for educational growth. Therefore, all analyses of the total sample were also conducted separately for each sex.

Results

Tables 2-7 show the variables which significantly differentiated the two growth groups in the preliminary discriminant analysis. Tables 2 and 5 are for men, Tables 3 and 6 for women, and Tables 4 and 7 for the total group. The hyphenated lines denote each separate computer run, which kept the sample size to predictor variable ratio above 20:1.

Insert Tables 2-7 about here

Of the 196 predictor variables, 19 for men, 20 for women, and 17 for the total group were significant ($\alpha = .05$). The five variables significant for both men and women were Watson-Glaser pretest Interpretation, 16PF Expedient Versus Proper, MMPI Validity ("faking-bad"), CPI Responsibility, and Watson-Glaser posttest total score. All five of these variables were also significant for the total group.

The 14 variables significant for men but not for women were: CTMM Memory, SSHA Education Acceptance, CSQ pretest Social Conscience, CSQ pretest Peer Independence, CUES pretest Propriety, CUES posttest Community, CSQ posttest Social Conscience, posttest academic college goals, and Marsh S & D pretest reported smoking habits, attitudes toward chapel, home situation, classroom seating preference, income that would be needed to live as they would like , and the extent religion had influenced their lives.

The 15 variables significant for women but not for men were: Watson-Glaser pretest Inference, CTMM Logical Reasoning, CTMM Total IQ, 16PF Less Intelligent Versus More Intelligent (Test Alertness), 16PF Relaxed Versus Tense, CUES pretest Scholarship, CUES posttest Scholarship, Watson-Glaser posttest Recognition of Assumptions, CSQ posttest Satisfaction with Faculty, the posttest College Board Control Test of Academic Aptitude, and Marsh S & D pretest reported high school GPA, percent of college expenses they expected to earn, hours per week spent studying, and attitudes about "cribbing."

Five variables significantly differentiated for the total group which did not differentiate for either sex. They were: CSQ posttest Satisfaction with Administration, nonconventional (idealistic) college goals, number of out-of-class social studies activities, Marsh S & D reported attitude toward smoking, and Marsh S & D reported belief about the Bible.

When all significant variables were analyzed for men, women, and total in the final discriminant analyses, five were found to be significant differentiators between the two groups for men, six for women, and five when the total sample was analyzed. All significant variables in the final discriminant analyses are reported in Table 8. Note that the only variable significant for both men and women was CPI Responsibility.

Insert Table 8 about here

Responses to 57 self-report items were tested using chi square analysis. Of the 57 items, 25 for men, 8 for women, and 7 for the total group had a significant chi square. Response distributions and chi square values for all items for which significance was found are shown in Table 9.

Insert Table 9 about here

Five of the variables had significant chi square values for both men and women. They were: classroom seating preference (negative growth students had more dislike for the front of the room), scholarships (more positive growth students had scholarships), drinking and smoking habit change (negative growth students indulged more and fewer abstained), income after college to live as would like (more negative growth students felt they would need a larger income), and satisfaction that the college is best for them personally (positive growth students were more satisfied).

Conclusion

In the present study, the negative growth group was differentiated from the positive growth group by habits, attitudes, self-concept, hostility, conformity, religious background and orientation, family relations, social relations, goals, high school achievement, and certain personality characteristics. There were noteworthy differences between

the two sexes on differentiating factors, and many more specific variables differentiated the two educational growth groups for men than for women.

In lieu of the unique nature of the population for the present study, it would be folly to try to generalize about students in general, or even about church related liberal arts colleges in general. Perhaps such generalizations to larger student populations will be possible if a number of similar studies with fewer variables under investigation at one time are conducted in the future. It is possible that unique and similar patterns (for the various types of colleges) that unfold as a number of studies are completed could be meaningful for instructional, counseling, advising, program planning, and other purposes. For example, it is possible that some members of the negative growth group could benefit from counseling.

The present study does demonstrate the extreme importance of studying the sexes separately. Although there were a number of similarities between the two sexes on significant variables, some patterns for the two sexes were quite different.

Indications are that the group of freshmen men at this college who exhibited negative educational growth, when compared to men exhibiting marked positive growth, did not have as many interpretational skills, had poorer memories, and were less academically oriented. The negative growth group also had less concern about

social injustice and "institutional wrongdoing," conformed more to prevailing peer norms, were more sociable and extroverted, were less expedient and more proper, were less cautious, and were more polite and considerate.

In the area of attitudes about religion and morals, more members of the negative growth group felt that religion had had less of an effect on their lives, felt that they were less religious than their parents, felt that the church was negative and outdated, disliked chapel, felt petting was okay, felt it was all right to have sex relations "with the person you intend to marry," and felt it was not important to marry someone of your own religion. Concerning moral habits and activities, more negative growth men smoked regularly, smoked and drank more since they came to college, and attempted "to go further" when out on a date.

Concerning attitudes towards other students, more negative growth men felt that their fellow students were hypocrites while more positive growth men saw their fellow students as either friendly and nice or as the finest anywhere. Conversely, more negative growth students felt that their fellow students saw them as average or "as big wheels" while more positive growth students felt that their fellow students saw them as the "good kids, the brains, or the quiet ones."

As for goals and aspirations, more negative growth men had a change towards lower college aspirations than when they entered

college, and were at college to gain a higher income occupation (fewer negative growth men than positive growth men indicated that a college goal was to develop their minds and intellectual abilities). Since more negative growth men had decreases in college aspirations, one would expect that they would tend to be less satisfied with their college experience. Surprisingly, there was not a significant difference between the two groups on self-reported satisfaction with the college overall (nor on any of the Satisfaction Scales of the College Student Questionnaires), but more of the negative growth men were unsure whether this college was best for them personally. Also, the lower mean score obtained by the negative growth men on the CUES Community Scale would imply that they see the campus atmosphere as less friendly, cohesive, supportive and sympathetic. They would see a less congenial atmosphere with less group welfare and less group loyalty.

The negative growth male group also differed from the positive growth group on several family background variables. More negative growth men came from broken homes and more of them did not have a close relationship with their father. Also, more of the negative growth men were at this college explicitly because of their parents' wishes.

Other findings were that more negative growth men, in comparison to the positive growth men, disliked sitting near the front of the classroom and felt that they needed a larger income after

college to live as they would like. Final differences noted between the two groups were that more men from the negative group had a car on campus, and fewer had received a scholarship.

Next we come to the women. In summary, significantly more negative growth women tended, in comparison to positive growth women, to be: Less responsible, less able and achievement oriented, more relaxed and open minded, less religious and moral, more dissatisifed with the faculty and with the college as a whole (and for them personally), and more conscious of a need for a larger income after college to be happy. More of the positive growth women worked harder, were more perserverent, reported more progress and achievements, and had idealistic and social concerns. Moreover, fewer of the positive growth women smoked and drank alcoholic beverages regularly, and they seemed more concerned about pleasing college officials and other adults.

As mentioned, there were important differences in significant findings between men and women. Areas having factors differentiating the male groups but not differentiating the female groups included: Attitudes towards premarital sex, attitudes towards other students, perceived reputation in the eyes of other students, family background, and family relations. Factors differentiating the female, but not the male groups, included: Grade achievement, academic abilities and skills, and dissatisfaction with the college as a whole (not including

the satisfaction for them personally).

Another general conclusion that might be drawn from the study is that it is desirable to explore non-linear relationships as well as linear relationships. Several of the group differences reinforced the findings of a related study of the same sample; e. g., the finding of linear relationships to educational growth for satisfaction, responsibility-independence, and social concern. However, other group differences added new dimensions that were only "hinted at" by the previous linear relationship results. For example, the relationship of educational growth to family background, negative attitudes, and self-gratification became much clearer after the present study was completed. There evidently are important nonlinear relationships between various predictor variables and educational growth.

Another finding was that the College Student Questionnaires (CSQ) did not seem to differentiate well between the two growth groups. In the previous study, CSQ scales were more often related linearly to educational growth, especially for men, than were those of any of the other instruments.

Another implication of the present study is concerned with the alienation of some of the students who exhibited negative educational growth. Not only did their dissatisfaction seem to affect their educational growth, but they were also less effective persons in other ways; e. g., poor social relations, a decrease in level of aspiration.

It seems probable that many of the students who dropped out of school would have fallen in the negative growth group had they not withdrawn prior to the posttest. It would seem worthwhile to compare the dropout groups to the negative and the positive growth groups using the pretest variables.

This finding about alienation supports the contention that a student's choice of college is important for college success. It is possible that the disenchanted negative growth students would have exhibited positive educational growth if they had attended a college with an environment more in harmony with their style of life. It should be noted, in addition, that many of these students would probably have gone to other colleges had they not been forced to attend this particular institution by their parents. The question might be raised as to whether college officials could help in any way to alleviate this situation. Perhaps something could be done through the mail or at a summer orientation session when both students and their parents are on campus.

There are several obvious limitations to the present study. The limited and unique population under study has already been mentioned. Secondly is the acknowledged unreliability of change scores. Adjusting the observed change to estimated true change raised the reliability figure to .72, which is about as good as you can expect for a measure of change, but the same trust still cannot be

placed in these change scores as in standard scores of an aptitude test with reliability above .90. Nevertheless, the reliability was certainly high enough for the adjusted scores to be worthy of analysis.

A third limitation is that the motivational and anxiety conditions were different for the pretest than for the posttest. The pretest was for college entrance and the students had much more at stake than during the retest, which they knew was for research purposes. There is the possibility that anxiety and motivational changes may cancel each other out, however, because French (1962) gave an equivalent form of the SAT to half of his group of students a few days before and to the other half a few days after they took the SAT for college entrance. At the beginning of the research period, the students were told that it was for research purposes only. They were also told that the scores would not be reported to any college, but that the scores would be reported to their high schools. French concluded from his results that the hypothesis of anxiety reducing the validity of the test "was not borne out."

Just what effects motivational and anxiety differences between pretest and posttest had on the results of the study are unanswered. However, the possibility of such effects stresses that future studies of such educational growth should take precautions to equalize pretest and posttest motivational and anxiety conditions. Another factor in the present study is that a very large amount of

data were being collected from students at one time, and particularly during the posttest. This could also have motivational effects.

In summary, the current study has demonstrated the potential "fruitfulness" of conducting research on student factors differentiating educational growth in college students. Such research has been neglected in the past. Research on educational growth in many diverse campus settings is needed.

In addition, new predictors such as interest scales need to be explored. Although many of the predictors used in the present study seemed to have much merit for exploration, all of the variables actually accounted for only a very small portion of the educational growth variance.

Finally, it is important that educational growth be explored in terms of other meaningful operational definitions. "Educational growth" is a term that undoubtedly has different meanings to different people in higher education.

REFERENCES

American College Testing Program. ACT technical report. Iowa City, Iowa: Author, 1965.

Barnes, M. W. Gains on the ACE during freshman-sophomore years. School and Society. 1943, 57, 250-252.

Bayley, Nancy. Data on the growth of intelligence between 16 and 21 years as measured by the Wechsler-Bellevue scale. The Journal of Genetic Psychology, 1957, 90, 3-15.

Bradway, K. P., & Robinson, N. M. Significant I. Q. changes in twenty-five years: a follow-up study. Journal of Educational Psychology, 1961, 52, 74-79.

Coffman, W. E., & Parry, M. W. Effects of an accelerated reading course on SAT-V scores. Personnel and Guidance Journal, 1967, 46, 292-296.

Coladarci, A. P. An analysis of Miller Analogies test score changes. Educational and Psychological Measurement, 1960, 20, 817-823.

Cowdery, K. M. Repeated Thorndike intelligence examinations. School and Society, 1928, 27, 367-369.

Deigman, F. J. Two-year changes on the ACE by students in a college of art and architecture. Journal of Psychology, 1959, 47, 223-230.

Flory, C. D. The intellectual growth of college students. Journal of Educational Research, 1940, 33, 443-451.

Freeman, F. N., & Flory, C. D. Growth in intellectual ability as measured by repeated tests. Monographs of the Society for Research in Child Development, 1937, 2.

French, J. W. Effect of anxiety on verbal and mathematical examination scores. Educational and Psychological Measurement, 1962, 22, 553-563.

Halinski, R. S. Predictor selection rules in multivariate situations: a Monte Carlo study. Unpublished Doctoral Dissertation, The University of Iowa, 1968.

Hartson, L. D. Does college training influence test intelligence? Journal of Educational Psychology, 1936, 27, 481-491.

Hunter, E. C. Change in scores of college students on the American Council Psychological Examination at yearly intervals during the college course. Journal of Educational Research, 1942, 36, 284-292.

Lenning, O. T. Student factors related to educational growth at a church-related liberal arts college. Unpublished Doctoral Dissertation, The University of Iowa, 1969.

Lenning, O. T., Munday, L. A., & Maxey, E. J. Student educational growth during the first two years of college. College and University, 1969, 30, 63-68.

Livesay, T. M. Does test intelligence increase at the college level. Journal of Educational Psychology, 1939, 30, 63-68.

Lord, F. M. The measurement of growth. Educational and Psychological Measurement, 1956, 16, 421-437.

Lord, F. M. Elementary models for measuring change. In C. W. Harris (Ed.). Problems in measuri ng change. Madison, Wisconsin: The University of Wisconsin Press, 1963, Pp. 21-28.

Louise, Sister M. Florence. Mental growth and development at the college level. Journal of Educational Psychology, 1947, 38, 65-83.

McConnell, T. R. Change in scores on the psychological examinations of the American Council on Education from the freshman to the senior year. Journal of Educational Psychology, 1934, 25, 66-69.

McNemar, Q. On growth measurement. Educational and Psychological Measurement, 1958, 18, 47-55.

Marsh, L. A. Manual for 1967-68 Abilene Christian College freshman testing project. Abilene, Texas: Abilene Christian College, 1969.

Miles, W. R. Age and human ability. Psychological Review, 1933, 40, 99-123.

Miles, C. C., & Miles, W. R. The correlation of intelligence scores and chronological age from early to late maturity. American Journal of Psychology, 1932, 44, 48-78.

Munday, L. A., & Hoyt, D. P. Changes in ACT scords after two years at a community junior college. Iowa City: American College Testing Program, 1964. (Mimeographed)

Rogers, A. L. The growth of intelligence at the college level. School and Society, 1930, 31, 693-699.

Silvey, H. M. Changes in test scores after two years in college. Educational and Psychological Measurement. 1951, 11, 494-502.

Shuey, Audrey M. Improvement in scores on the American Council Psychological Examination from freshman to senior year. Journal of Educational Psychology, 1948, 39, 417-425.

Stalnaker, Ruth, & Stalnaker, J. The effect on a candidate's score of repeating the scholastic aptitude test of the College Entrance Examination Board. Educational and Psychological Measurement, 1946, 6, 495-503.

Table 1

FREQUENCY DISTRIBUTIONS OF OBSERVED ACT CHANGE SCORES AT FIVE DIFFERENT COLLEGES

SCORE	Church Lib. Arts College	State Junior College	State Teachers College	State College	State University	SCORE
+9			2	1	1	+9
+9			1	1	1	+9
+8			2	1	1	+8
+7			4	2	3	+7
+6	2	1	8	2	6	+6
+5	5	5	11	10	16	+5
+4	6	6	19	17	28	+4
+3	23	9	33	32	39	+3
+2	25	9	46	45	44	+2
+1	52	10	32	37	35	+1
0	36	12	27	27	24	0
-1	26	5	21	24	25	-1
-2	13	7	17	16	9	-2
-3	8	0	4	7	2	-3
-4	3	2	2	1	1	-4
-5	1	2	1	3	1	-5
-6			0	1		-6
-7			0	0		-7
-8			0	1		-8
-9			1			-9
% Increasing	57	59	70	65	74	
% Decreasing	26	24	19	23	16	
Sample Size	200	68	240	228	236	

TABLE 2

SUMMARY OF PRETEST DISCRIMINANT MULTIPLE COMPUTER ANALYSES FOR EQUALLY ABLE[a] GROUPS OF MEN

Significant Variables	NEG GRTH GRP Mean	S.D.	POS GRTH GRP Mean	S.D.	F to Enter or Remove[b]	U-Statistic
WG1-Interpret	18.06	2.89	19.15	2.62	6.89	.96
CTMM-Memory	18.58	3.42	20.11	3.05	9.87	.85
SSHA-Ed Accept	28.32	7.71	31.01	6.40	6.36	.96
CSQ1-SC	26.08	4.93	28.57	5.16	10.69	.94
CSQ1-PI	21.91	3.95	23.31	4.00	6.25	.91
16PF-G	61.60	19.13	67.51	20.60	3.89	.98
CUES 1-Propriety	20.63	3.89	22.38	3.25	4.43	.89
Marsh-18 Smoking	8.19	1.67	8.72	0.79	7.08	.96
Marsh-21 Chapel	5.51	1.43	6.11	1.18	9.29	.95
Marsh-28 Home Sit	8.36	1.46	8.77	0.84	4.74	.92
Marsh-50 Seat pref	5.78	1.91	6.39	1.73	4.81	.97
Marsh-54 Income to live as would like	4.78	1.70	4.16	1.36	7.28	.96
Marsh-73 Relig infl	6.20	1.19	7.85	0.64	7.25	.96

[a] Matched on ACT pretest scores.

[b] $\alpha = .05$

TABLE 3

SUMMARY OF PRETEST DISCRIMINANT MULTIPLE COMPUTER ANALYSES FOR EQUALLY ABLE[a] GROUPS OF WOMEN

Significant Variables	NEG GRTH GRP Mean	NEG GRTH GRP S.D.	POS GRTH GRP Mean	POS GRTH GRP S.D.	F to Enter or Remove[b]	U-Statistic
WG1-Interpret	18.00	3.02	19.53	2.56	13.19	.93
WG1-Inference	12.17	2.86	12.07	2.42	4.05	.91
CTMM-Log Reason	29.06	4.79	30.86	3.85	4.8	.88
CTMM Total IQ	59.90	12.97	65.00	9.38	8.94	.95
16PF-B	51.44	19.71	60.15	17.32	9.69	.95
16PF-G	66.53	21.56	76.18	17.94	10.41	.94
16PF-Q4	60.01	19.54	53.05	17.31	6.27	.97
COEST-Scholarship	22.90	3.58	24.15	3.24	5.58	.89
Marsh-33 HS GPA	5.65	1.74	6.23	1.44	5.77	.97
Marsh-23 Earn exp	2.13	1.63	2.74	1.82	4.41	.94
Marsh-48 Hours Studying	5.39	1.82	6.19	1.57	9.92	.95
Marsh-61 Att about Cribbing	7.66	1.29	8.09	0.93	6.46	.96

[a] Matched on ACT pretest scores.

[b] $\alpha = .05$

TABLE 4

SUMMARY OF PRETEST DISCRIMINANT MULTIPLE COMPUTER ANALYSES FOR EQUALLY ABLE GROUPS[a] OF MEN AND WOMEN COMBINED

Significant Variables	NEG GRTH GRP Mean	NEG GRTH GRP S.D.	POS GRTH GRP Mean	POS GRTH GRP S.D.	F to Enter or Remove[b]	U-Statistic
WG1-Interpret	18.03	2.95	19.34	2.59	19.69	.95
CTMM-Memory	19.02	3.34	20.38	2.89	7.85	.93
CSQ1-SC	28.03	4.85	29.93	4.78	13.75	.96
16PF-B	51.95	20.24	59.22	18.10	9.69	.94
16PF-G	64.07	20.47	71.85	19.75	13.16	.95
Marsh-18 Smoking	8.49	1.30	8.82	0.59	9.36	.97
Marsh-33 HS GPA	5.17	1.76	5.70	1.69	5.92	.96
Marsh-48 Hours Study	5.46	1.76	6.10	1.56	13.15	.96
Marsh-50 Seat Pref	6.07	1.87	6.60	1.55	6.26	.95
Marsh-57 Smoking	3.74	0.95	3.99	0.86	5.36	.93
Marsh-66 Bible	8.89	0.54	8.80	0.78	4.76	.92

[a] Matched on ACT pretest scores.

[b] $\alpha = .05$.

TABLE 5

SUMMARY OF POSTTEST DISCRIMINANT MULTIPLE COMPUTER ANALYSES FOR EQUALLY ABLE GROUPS[a] OF MEN

Significant Variables	NEG GRTH GRP Mean	NEG GRTH GRP S.D.	POS GRTH GRP Mean	POS GRTH GRP S.D.	F to Enter or Remove[b]	U-Statistic
MMPI-F	63.51	15.20	56.49	10.34	12.84	.93
CPI-Re	40.05	11.59	46.64	9.66	16.78	.91
WG2-Total	63.32	10.19	73.76	9.07	14.01	.93
CUES2-Community	20.16	3.91	22.03	3.41	9.39	.88
CS02-SC	25.58	5.50	27.89	5.84	7.27	.96
Special ACT Posttest Academic Goals	2.44	1.30	2.89	1.48	4.04	.98

[a] Matched on ACT pretest scores.

[b] $\alpha = .05$.

TABLE 6

SUMMARY OF POSTTEST DISCRIMINANT MULTIPLE COMPUTER ANALYSES FOR EQUALLY ABLE GROUPS[a] OF WOMEN

Significant Variables	NEG GRTH GRP Mean	NEG GRTH GRP S.D.	POS GRTH GRP Mean	POS GRTH GRP S.D.	F to Enter or Remove[b]	U-Statistic
MMPI-F	57.11	10.77	52.52	6.32	11.89	.94
MMPI-L	48.97	6.33	51.35	7.11	4.48	.91
CPI-Re	46.47	8.98	51.60	8.35	13.46	.92
WG2-Total	70.49	11.43	75.48	8.65	10.56	.94
CUES2-Scholarship	15.78	5.56	17.16	5.45	4.79	.92
WG2-Recognition of Assumptions	12.22	3.33	12.70	3.12	4.07	.90
CSQ2-SF	26.88	4.66	29.31	4.37	12.77	.93
CSQ2-Control test	17.14	4.44	19.44	4.67	11.71	.87

[a] Matched on ACT pretest scores.

[b] $\alpha = .05$.

TABLE 7

SUMMARY OF POSTTEST DISCRIMINANT MULTIPLE COMPUTER ANALYSES FOR EQUALLY ABLE GROUPS[a] OF MEN AND WOMEN COMBINED

Significant Variables	NEG GRTH GRP Mean	S.D.	POS GRTH GRP Mean	S.D.	F to Enter or Remove[b]	U-Statistic
CPI-Re	43.26	10.83	49.12	9.34	29.59	.92
MMPI-F	60.31	13.52	54.51	8.77	6.28	.91
WG2-Total	69.40	10.85	74.62	8.88	24.35	.93
CSQ2-SA	21.80	5.54	23.89	6.01	10.26	.91
Special ACT questionnaire Nonconventional College goals	2.72	1.66	3.09	1.52	5.62	.94
Special ACT questionnaire Social Studies activities	5.69	1.94	5.31	1.94	5.11	.92

[a] Matched on ACT pretest scores.

[b] $\alpha = .05$.

TABLE 8

SUMMARY OF FINAL DISCRIMINANT ANALYSES
FOR MEN, WOMEN, AND TOTAL

Step Number	VARIABLE Entered	Removed	DISCRIMINANT FUNCTIONS Neg Grun Group	Pos Grun Group	F Value[a] to Enter or Remove	U-Statistic
Men[b]						
1	CPI-Re		0.076	0.123	16.780	.912
2	WG2-Total		1.695	1.906	7.771	.873
3	Marsh-50 Seat Pref		0.704	0.750	5.368	.846
4	Special ACT posttest					
	Social Studies activities		1.251	1.349	4.569	.824
5	CUES2-Community		1.20	1.015	4.231	.804
Women[c]						
1	CPI-Re		Removed from eq later		15.455	.918
2	DSQ2-SF		-0.015	-0.226	8.381	.876
3	WG1-Interpret		1.618	1.841	8.262	.836
4	WG1-Inference		1.266	1.371	5.449	.810
5	CSQ2-Control test		Removed from eq later		4.471	.789
6	16PF-G		0.145	0.167	3.872	.772
7		CPI-Re			3.566	.788
8	CTMM-Log Reason		0.305	0.348	4.266	.769
9		CSQ2-Control test			3.776	.786
10	CPI-Re		1.065	1.154	4.109	.767

TABLE 8 (Continued)

Step Number	VARIABLE Entered	Removed	DISCRIMINANT FUNCTIONS Neg Grth Group	Pos Grth Group	F Value[a] to Enter or Remove	U-Statistic
Total[d]						
1	CPI-Re		2.594	2.734	29.591	.922
2	WG1-Interpret		0.767	0.737	14.464	.885
3	Marsh-50 Seat Pref		0.373	0.397	7.108	.868
4	Marsh-48 Hours Study		0.770	0.808	4.953	.855
5	MMPI-F		1.141	1.296	4.700	.844

NUMBER OF CASES CLASSIFIED INTO EACH OF 6 GROUPS

	MEN		WOMEN		TOTAL	
	Neg Grth Group	Pos Grth Group	Neg Grth Group	Pos Grth Group	Neg Grth Group	Pos Grth Group
Neg Grth Grp	58	30	61	27	111	65
Pos Grth Grp	21	67	19	69	45	131

[a] $\alpha = .05$.

[b] Discriminant constants are -46.708 for negative men and -54.305 for the positive men.

[c] Discriminant constants are -59.094 for negative women and -70.024 for positive women.

[d] Discriminant constants are -81.903 for the negative total group and -87.881 for the positive total group.

TABLE 9

CHI SQUARE TESTS OF INDEPENDENCE FOR FREQUENCY DATA

ITEM RESPONSES	MEN Neg %	MEN Pos %	WOMEN Neg %	WOMEN Pos %	TOTAL Neg %	TOTAL Pos %
Compared with the religious faith of my parents, I am:						
1-3. Less religious	34	22	15	12	25	18
4. About as religious	44	65	68	59	56	61
5-7. More religious	22	13	17	29	19	21
CHI SQ (df=2)	8.932*		4.102		1.453	
Concerning smoking habits, I smoke:						
1-7. Regularly	12	4	3	0	8	2
8. Rarely	20	14	9	7	15	10
9. Never	68	82	88	93	77	88
CHI SQ (df=2)	6.365*		3.388		5.333	
Concerning chapel attendance:						
1-3. Against	7	4	2	2	5	4
4-5. Rather neutral	37	14	7	13	21	12
6-7. Definitely positive	66	82	91	85	74	84
ChI SQ (df=2)	12,920**		2,005		3.199	
Classroom seating preference:						
1-3. Towards the back	13	5	7	0	9	3
5-6. In the middle	37	23	29	20	33	21
4,7-8. Towards the front	50	72	64	80	58	76
CHI SQ (df=2)	10,789**		10,431**		8,085*	
Attitudes towards betting:						
1-3. OK	20	7	1	2	10	4
4-7. OK sometimes	35	38	18	18	27	28
8-9. Wrong	45	55	81	80	63	68
CHI SQ (df=2)	7.382*		0.340		2,780	

TABLE 9 (Continued)

ITEM RESPONSES	MEN Neg %	MEN Pos %	WOMEN Neg %	WOMEN Pos %	TOTAL Neg %	TOTAL Pos %
How he thinks others see him:						
3. The quiet ones	2	5	3	0	3	4
4. The avg ones	30	19	22	22	24	20
5. The wheels	21	11	10	10	15	11
6. The brains	2	7	5	8	3	7
7. The good kids	42	55	59	60	50	58
Others	3	3	2	0	3	2
CHI SQ (df=5)	11.400*		5.726		3.991	
Scholarship Plans:						
1. For 1st yr	48	68	47	63	49	66
2. After 1st yr	19	11	13	15	16	13
3. Never	33	21	40	22	35	21
CHI SQ (df=2)	10,500**		11,000**		7.100*	
Since coming to college has smoked:						
1-3. More	24	14	3	0	13	8
4. Same	14	3	8	0	11	2
5-7. Less	16	18	20	8	18	12
8. Never smoked	46	65	69	92	58	78
CHI SQ (df=3)	13.119**		19.429**		11.542**	
Since coming to college has drank:						
1-3. More	10	4	4	0	7	2
4. Same	14	3	3	1	9	3
5. At home only	5	2	3	1	4	1
6-8. Less	33	22	20	8	26	14
9. Never drank	38	69	70	91	54	80
CHI SQ (df=4)	22.156**		15.478**		16.223**	
Income after college needed to live as would really like:						
Under $15,000	43	62	52	64	47	63
15,000-25,000	26	22	25	23	25	23
over 25,000	31	16	23	13	28	14
CHI SQ (df=2)	8.559*		6.500*		2.333	

TABLE 9 (Continued)

ITEM RESPONSES	MEN Neg %	MEN Pos %	WOMEN Neg %	WOMEN Pos %	TOTAL Neg %	TOTAL Pos %
Most of the students here are:						
Immature	7	8	6	1	7	5
Hypocrites	27	9	2	6	15	8
Like students everywhere	25	20	20	16	22	18
Friendly & nice	15	22	31	29	22	25
Finest anywhere	26	41	41	48	34	44
	CHI SQ (df=4)	14.305**		6.633		4.337
Influence of religion on your life:						
Negative	15	2	4	3	10	3
Positive	85	98	96	97	90	97
	CHI SQ (df=1)	9.257**		0.000		2.962
The church of Christ is neg and outdated:						
1-2. Agree	49	39	38	31	42	34
3. No opinion	17	10	7	9	13	10
4-5. Disagree	35	52	55	60	45	56
	CHI SQ (df=2)	6.299*		0.109		3.599
Is it all right to have sex relations with the person you intend to marry:						
1-2. Agree	14	8	4	1	8	5
3,6. Depends-neutral	21	10	12	6	17	8
4-5. Disagree	65	82	86	93	75	87
	CHI SQ (df=2)	7.506*		2.607		4.871
If chapel attendance were voluntary, would attend:						
1-2. Rarely or never	31	12	13	6	21	9
3-6. 1-4 times a wk	50	54	57	50	54	52
7-9. Almost always	19	34	30	44	25	39
	CHI SQ (df=2)	12.794**		5.646		7.900*

TABLE 9 (Continued)

ITEM RESPONSES	MEN Neg %	MEN Pos %	WOMEN Neg %	WOMEN Pos %	TOTAL Neg %	TOTAL Pos %
How important is it to marry someone of your own religion?						
1-3. Important	78	93	98	99	88	93
4-5. Not important	22	7	2	1	12	7
CHI SQ (df=1)	7.905**		0.000		0.931	
When on a date, how far do you generally attempt to go?						
1-4. Little contact	21	25	40	35	30	31
5-6. Much kissing only	24	42	48	50	3	46
7-8. Petting	29	24	11	15	21	19
9. All the way	25	9	1	0	13	4
CHI SQ (df=3)	13.102**		1.990		6.101	
Level of aspiration changes in college:						
1-2. Plan less now	25	12	24	17	25	14
3-4. No change	21	43	30	36	25	40
5-7. Plan more now	54	45	46	47	50	46
CHI SQ (df=2)	12.950**		1.751		6.731*	
Students here are friendly and cooperative:						
1. Few or none	5	6	3	5	4	5
2. Some	15	5	5	2	10	5
3. About half	8	2	2	3	5	5
4. Most	41	45	38	36	40	40
5. Almost all	31	42	52	49	41	45
CHI SQ (df=4)	10.534*		5.529		1.964	
Factors most influencing enrollment at this college:						
1,3. Parents wishes	36	16	20	17	25	17
2,5. Practical	11	14	8	13	8	14
4. Friends who attended	10	9	9	8	10	9
6. Christian Ed & quality school	36	51	48	51	42	51
7. Never really considered another school	6	1	7	9	7	

TABLE 9 (Continued)

ITEM RESPONSES	MEN Neg %	MEN Pos %	WOMEN Neg %	WOMEN Pos %	TOTAL Neg %	TOTAL Pos %
8. Other	2	9	11	2	8	3
CHI SQ (df=5)	18.103**		10.429		6.433	
Evaluation of this college for you personally:						
1-2. Dissatisfied	19	19	13	9	16	14
3. On the fence	27	10	18	7	22	9
4-5. Satisfied	54	71	69	84	62	77
CHI SQ (df=2)	10.123**		7.038*		7.204*	
How close are you to your father:						
1. Extremely close	11	28	22	22	15	25
2. Quite close	35	36	33	27	38	31
3. Somewhat close	27	25	22	20	24	22
4. Not very close	15	11	21	22	18	17
5. Father deceased	12	0	2	9	5	5
CHI SQ (df=4)	20.117**		5.173		7.337	
How honestly do you feel you have answered all items in the personality inventories taken in this research battery of tests:						
1. As honestly as possible on all	81	84	87	88	85	86
2. Honestly except on very personal matters 90% or more	6	13	12	7	9	10
3. About 80 to 90%	8	3	1	4	4	3
4. More than half of the time	3	0	0	1	1	1
5. Less than half of the time	2	0	0	0	1	0
CHI SQ (df=4)	9.906*		4.121		1.201	
Most important college goal:						
Enjoy life	1	5	5	2	3	3
Develop mind	24	49	44	30	34	39

TABLE 9 (Continued)

ITEM RESPONSES	MEN Neg %	MEN Pos %	WOMEN Neg %	WOMEN Pos %	TOTAL Neg %	TOTAL Pos %
Vocation	36	35	21	33	29	34
Marriage	1	3	12	10	6	6
High income	16	2	2	2	9	2
Other	22	17	16	23	19	16
CHI SQ (df=5)	23.211**		8.039		5.451	
How satisfied are you with your college?						
1. fair for me	19	18	10	2	15	10
2. good for me	41	32	42	34	41	33
3. best for me	40	50	48	64	44	57
CHI SQ (df=2)	0.225		8.461*		3.538	
Do you have a car on campus?						
1. yes	59	42	26	23	43	33
2. no	41	58	74	77	57	67
CHI SQ (df=1)	5.121*		0.108		1.719	
Progress in understanding & appreciation sci & tech:						
1. substantial	16	27	11	16	14	22
2. some	41	39	26	44	34	41
3. not much	43	34	63	40	52	37
CHI SQ (df=2)	3.916		10.690**		4.959	

* Significant at the P=.05 level.

** Significant at the P=.01 level.

Note: Yate's correction was used in calculating all Chi Squares with df=1.